

OA OUTSIDE AIR TEMP. SENSOR DPS DIFFERENTIAL PRESSURE SENSOR RETURN AIR TEMP. SENSOR (HS) HIGH STATIC SENSOR (SD) SMOKE DETECTOR HHL HIGH HUMIDITY LIMIT LS LOW STATIC SENSOR SPACE HUMIDITY SENSOR RELATIVE HUMIDITY SENSOR STATIC PRESSURE SENSOR MIXED AIR TEMPERATURE TS SUPPLY TEMP. SENSOR MDA MOTORIZED DAMPER ACTUATOR SUPPLY AIR TEMPERATURE RAT RETURN AIR TEMPERATURE

AHU-5 AND HRU-5, CONTROL SEQUENCE:

A. AHU-5 SHALL BE PROVIDED WITH DEDICATED DDC CONTROLLERS TO IMPLEMENT THE SEQUENCE OF OPERATION DESCRIBED BELOW:

(i) OPERATING SCHEDULES AND TEMPERATURE SETPOINTS SHALL BE STORED IN NON-VOLATILE MEMORY.

(ii) SCHEDULED HOURS OF OPERATION SHALL BE DETERMINED BY THE OWNER. AT A MINIMUM, THE UNIT SCHEDULE SHALL BE CAPABLE OF PROVIDING SEPARATE OCCUPIED/UNOCCUPIED SCHEDULES FOR MONDAY-FRIDAY, SATURDAY, SUNDAY AND HOLIDAYS.

(iii) <u>CC-5</u> SHALL PROVIDE THE FIRST AND SECOND STAGES OF COOLING. (iv) <u>CC-5A</u> SHALL PROVIDE THE THIRD AND FOURTH STAGES OF COOLING.

B. <u>HRU-5</u> SHALL BE PROVIDED WITH DEDICATED DDC CONTROLLERS TO IMPLEMENT THE SEQUENCE OF OPERATION DESCRIBED BELOW: (i) OPERATING SCHEDULES AND TEMPERATURE SETPOINTS SHALL BE STORED IN NON-VOLATILE MEMORY

(ii) SCHEDULED HOURS OF OPERATION SHALL BE DETERMINED BY THE OWNER. AT A MINIMUM, THE UNIT SCHEDULE SHALL BE CAPABLE OF PROVIDING SEPARATE OCCUPIED/UNOCCUPIED SCHEDULES FOR MONDAY-FRIDAY, SATURDAY, SUNDAY AND HOLIDAYS.

C. IF A VFD FAILS, AN ALARM WILL BE SET AT THE OPERATORS WORKSTATION. THE REDUNDANT VFD WILL AUTOMATICALLY START. D. THE DDC SYSTEM WILL UTILIZE THE FAN CURRENT SENSORS INSTALLED BY THE MANUFACTURER TO MONITOR EACH FAN IN THE ARRAY. IF A FAN FAILS, THE AHU FAN CONTROLLER WILL CLOSE THE ASSOCIATED FAN BACKDRAFT DAMPER AND REMOVE THE FAN FROM THE CONTROL SEQUENCE. THE AHU CONTROLLER WILL MODULATE THE REMAINING FANS TO MAINTAIN THE CFM SETPOINT. AN ALARM WILL BE SET AT THE OPERATORS WORKSTATION INDICATING WHICH FAN HAS FAILED.

2. SYSTEM GRAPHICS: THE SYSTEM GRAPHICS SHALL DISPLAY AND LOG ALL POINTS INDICATED ON THE CONTROL SCHEMATIC, SEQUENCE OF OPERATION AND THE FOLLOWING ITEMS: A. DAMPER POSITION OF <u>D-1</u>, <u>D-2</u>, <u>D-3</u>, AND <u>D-4</u>. B. VALVE POSITION OF <u>V-1, V-2, V-3, V-4, V-5 AND V-6</u>.

C. SETPOINT AND MEASURED AIRFLOW FOR SF-5, HRSF-5 AND HREF-5. (i) IF THE MEASURED AIRFLOW EXCEEDS +-5% (ADJ.) FROM THE SETPOINT, AN ALARM WILL BE SET AT THE OPERATORS WORKSTATION. D. SPACE RELATIVE HUMIDITY AS SENSED BY THE ROOM MOUNTED HUMIDISTAT.

E. STATUS, SPEED AND FAULT ALARMS FOR EACH VFD. F. STATUS OF EACH FAN IN THE FAN WALL.

G. FLOW RATE OF CHILLED WATER METER, CWM-5. LOG PEAK GPM AND TIME OF PEAK GPM PER 24

H. ENTERING AND LEAVING CHILLED WATER TEMPERATURE. I. THE DIFFERENTIAL PRESSURE MEASURED ACROSS EACH FILTER: (i) PROVIDE A YELLOW MAINTENANCE WARNING WHEN THE DIFFERENTIAL PRESSURE

EXCEEDS 0.7 INCHES (ADJ.). (ii) PROVIDE A RED MAINTENANCE WARNING WHEN THE DIFFERENTIAL PRESSURE EXCEEDS 0.9

INCHES (ADJ.). GENERAL INTERLOCKS: A. INTERLOCK HRSF-5 WITH SF-5 AND DAMPERS D-1 AND D-2.

(i) IF EITHER HRSF-5, OR SF-5 IS TURNED OFF MANUALLY, THROUGH THE BMS OR BY A SAFETY INTERLOCK, BOTH FANS SHALL STOP AND DAMPERS <u>D-1</u> AND <u>D-2</u> SHALL CLOSE. B. INTERLOCK <u>HREF-5</u> WITH DAMPERS <u>D-3</u> AND <u>D-4</u>. C. INTERLOCK THE SPACE RELATIVE HUMIDITY SENSOR WITH SF-5.

(i) INTERLOCK THE HHL SENSOR WITH THE H-1 STEAM SHUT-OFF VALVE V-7.

APPROVED:

4. SAFETY INTERLOCKS: A. IF THE BUILDING FIRE DETECTION SYSTEM GOES INTO ALARM, FANS HRSF-5, HREF-5 AND SF-5

SHALL BE DISABLED. MANUAL RESTART IS REQUIRED. B. IF A DUCT MOUNTED SMOKE DETECTOR GOES INTO ALARM, FANS <u>HRSF-5</u>, <u>HREF-5</u> AND <u>SF-5</u> SHALL BE DISABLED. AN ALARM SHALL BE SET AT THE OPERATORS WORKSTATION AND THE FIRE ALARM CONTROL PANEL. MANUAL RESTART IS REQUIRED.

C. IF <u>T-5</u> FALLS BELOW 40 DEGREES F (ADJ.), FANS <u>HRSF-5</u>, <u>HREF-5</u> AND <u>SF-5</u> SHALL BE DISABLED. AN ALARM SHALL BE SET AT THE OPERATORS WORKSTATION. MANUAL RESTART IS REQUIRED. D. IF THE SUPPLY STATIC PRESSURE EXCEEDS THE HIGH LIMIT SETPOINT, FANS HRSF-5 AND SF-5 SHALL BE DISABLED. AN ALARM SHALL BE SET AT THE OPERATORS WORKSTATION. THE SUPPLY STATIC HIGH LIMIT SETPOINT SHALL BE ADJUSTABLE FROM THE OPERATORS WORKSTATION.

5. SYSTEM OPERATION: THE SYSTEM MODE OF OPERATION SHALL BE INITIATED BY THE BMS. A. OCCUPIED:

(i) DAMPER <u>D-1</u> AND <u>D-2</u> SHALL OPEN. <u>HRSF-5</u> AND <u>SF-5</u> SHALL SLOWLY RAMP UP TO SPEED. (A) <u>HRSF-5</u> AND <u>SF-5</u> SHALL MAINTAIN THE SCHEDULED SUPPLY AIRFLOW RATE AS MEASURED BY THE AIR MONITORS. THE AIRFLOW RATE SHALL BE ADJUSTABLE FROM THE OPERATORS WORKSTATION. IF REQUIRED, DETERMINE, DISPLAY AND PROGRAM IN OFFSET AIRFLOW RATE BETWEEN EACH AIR MONITOR TO MAINTAIN EQUAL FLOW THROUGH EACH FAN.

(ii) DAMPER <u>D-3</u> AND <u>D-4</u> SHALL OPEN. <u>HREF-5</u> SHALL SLOWLY RAMP UP TO SPEED. (A) HREF-5 SHALL MAINTAIN THE SCHEDULED EXHAUST AIRFLOW RATE AS MEASURED BY THE AIR MONITOR. THE AIRFLOW RATE SHALL BE ADJUSTABLE FROM THE OPERATORS

(iii) HEAT WHEEL HW-1: (A) THE <u>HW-1</u> CONTROLLER SHALL MONITOR <u>T-1</u>, <u>T-2</u>, <u>T-3</u> AND <u>T-4</u>. THE WHEEL ROTATION

SHALL BE MODULATED TO MAXIMIZE ENERGY RECOVERY AND PREVENT FROST FORMATION ON THE WHEEL.

(iv) COOLING (FOUR STAGES): THE SUPPLY LEAVING AIR TEMPERATURE (LAT) SETPOINT SHALL BE MAINTAINED AT 52 DEGREES (ADJ.), AS MEASURED BY SENSOR <u>T-7</u>. THE BMS SHALL MONITOR THE POSITION OF EACH TAD REHEAT VALVE, THE SUPPLY LAT SHALL BE RESET BETWEEN 52 DEGREES (ADJ.) AND 62 DEGREES (ADJ.) TO MINIMIZE THE USE OF REHEAT. IF THE SPACE RELATIVE HUMIDITY RISES ABOVE 60% (ADJ.), THE LAT SHALL BE RESET TO 52 DEGREES UNTIL THE SPACE RELATIVE HUMIDITY FALLS BELOW 55% (ADJ.). (A) STAGE 1:

1) VALVE <u>V-1</u> SHALL MODULATE TO MAINTAIN THE SUPPLY AIR SETPOINT. 2) IF V-1 IS 100% OPEN AND THE SUPPLY AIR TEMPERATURE RISES 2 DEGREES ABOVE SETPOINT (ADJ.), STAGE 2 SHALL BE ENABLED.

2) IF <u>V-2</u> IS 100% OPEN AND THE SUPPLY AIR TEMPERATURE RISES 2 DEGREES ABOVE SETPOINT (ADJ.), STAGE 3 SHALL BE ENABLED. 1) VALVE <u>V-3</u> SHALL MODULATE TO MAINTAIN THE SUPPLY AIR SETPOINT.

1) VALVE <u>V-2</u> SHALL MODULATE TO MAINTAIN THE SUPPLY AIR SETPOINT.

2) IF <u>V-3</u> IS 100% OPEN AND THE SUPPLY AIR TEMPERATURE RISES 2 DEGREES ABOVE SETPOINT (ADJ.), STAGE 4 SHALL BE ENABLED. (A) STAGE 4:

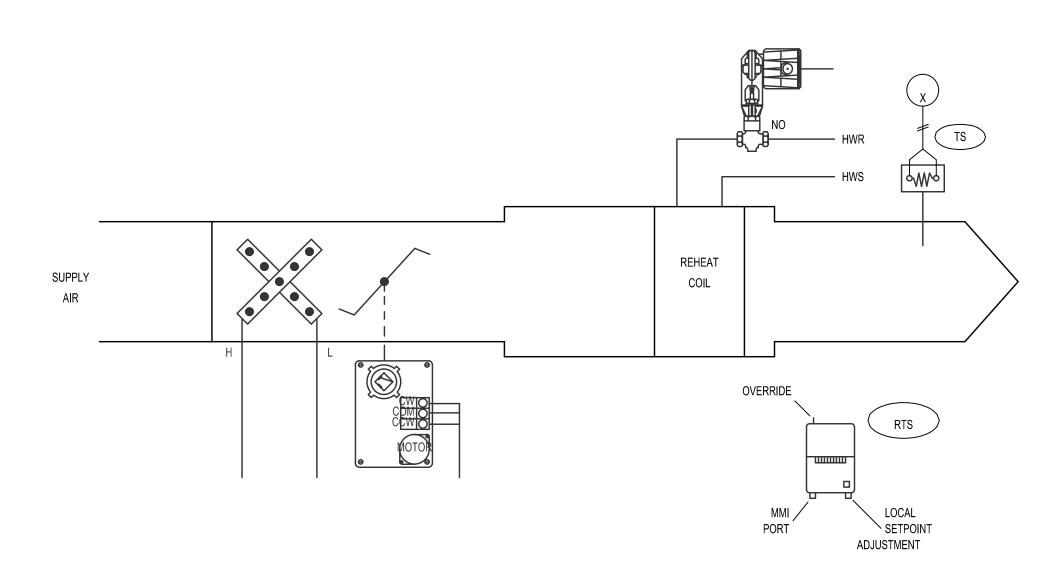
1) VALVE V-4 SHALL MODULATE TO MAINTAIN THE SUPPLY AIR SETPOINT. (v) HEATING: IF THE SUPPLY AIR TEMPERATURE FALLS 5 DEGREES (ADJ.) BELOW THE SUPPLY AIR SETPOINT (55 DEGREES, ADJ.), THE HEATING VALVE SHALL OPEN AND THE BY-PASS DAMPER SHALL BE MODULATED TO MAINTAIN THE SUPPLY AIR SETPOINT BASED ON THE TEMPERATURE MEASURED BY SENSOR $\underline{\mathsf{T-7}}$.

B. NIGHT SETBACK MODE: (i) THE SUPPLY AIR SETPOINT SHALL BE RESET TO THE TEMPERATURE DEFINED BY THE

(ii) THE SPACE TEMPERATURE OF OWNER DESIGNATED TERMINAL AIR DEVICE WILL BE RESET TO THE TEMPERATURE DEFINED BY THE OWNER.

APPROVED: Safety Manager

(i) VALVE $\overline{\text{V-6}}$ SHALL BE MODULATED TO MAINTAIN THE SPACE MINIMUM RELATIVE HUMIDITY SETPOINT (45%, ADJ.) AS SENSED BY THE SPACE MOUNTED HUMIDISTAT.



TERMINAL AIR DEVICE W/ REHEAT SEQUENCE OF OPERATION

THE VAV TERMINAL DEVICE IS CONTROLLED WITHIN USER DEFINED SEPARATE HEATING AND COOLING MAXIMUM AND MINIMUM SUPPLY AIR VOLUME SETTINGS. THE COOLING/HEATING MAXIMUM AIR VOLUME SHALL EQUAL THE MINIMUM COOLING/HEATING AIR VOLUME SETTINGS. THE VAV TERMINAL DEVICE HEATING AND COOLING MAXIMUM AND MINIMUM SUPPLY AIR VOLUME SETTINGS SHALL BE CAPABLE OF BEING RESET AT THE OPERATORS WORKSTATION.

THE TERMINAL EQUIPMENT CONTROLLER MONITORS THE ROOM TEMPERATURE SENSOR AND AIR VELOCITY SENSOR. THROUGH 3 PROPORTIONAL, INTEGRAL, AND DERIVATIVE ALGORITHMS, THE CONTROLLER MODULATES THE SUPPLY AIR DAMPER AND REHEAT VALVE TO MAINTAIN THE DESIRED ROOM TEMPERATURE.

DAY (OCCUPIED) OPERATION:

THE COOLING OPERATION FUNCTIONS AS FOLLOWS:

THE ROOM TEMPERATURE IS COMPARED TO THE COOLING SETPOINT. THE CONTROLLER WILL MODULATE THE SUPPLY AIR DAMPER TO MAINTAIN THE COOLING SETPOINT. THE SUPPLY AIR VOLUME WILL BE LIMITED BY THE COOLING MINIMUM AND MAXIMUM SUPPLY AIR VOLUME SETTINGS.

THE HEATING OPERATION FUNCTIONS AS FOLLOWS:

THE ROOM TEMPERATURE IS COMPARED TO THE HEATING SETPOINT.

DURING THE HEATING OPERATION, THE CONTROLLER POSITIONS THE SUPPLY AIR DAMPER TO THE HEATING MINIMUM VOLUME SETTING. THE CONTROLLER WILL MODULATE THE REHEAT VALVE TO MAINTAIN THE HEATING SETPOINT.

NIGHT (UNOCCUPIED) OPERATION:

THE REHEAT VALVE IS CLOSED.

UPON COMMAND FROM THE STAND-ALONE CONTROL UNIT TO CHANGE OVER TO NIGHT MODE, THE TERMINAL BOX CONTROLLER WILL CONTROL USING THE NIGHT COOLING AND

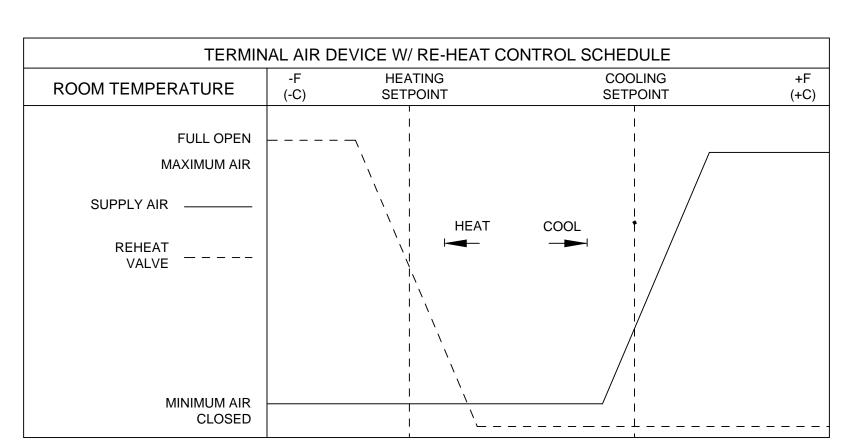
THE CONTROLLER MAY BE RESET TO THE DAY MODE FOR A PREDETERMINED TIME PERIOD UPON A SIGNAL FROM THE CONTROL SYSTEM OR MANUALLY AT THE ROOM SENSOR.

SYSTEM GRAPHICS: THE SYSTEM GRAPHICS SHALL DISPLAY THE FOLLOWING ITEMS: MODE OF OPERATION: HEATING/COOLING

SPACE TEMPERATURE SETPOINTS: HEATING/COOLING. SPACE TEMPERATURE.

SUPPLY AIR TEMPERATURE. SUPPLY CFM SETPOINT.

SUPPLY CFM. POSITION OF REHEAT VALVE.



NOTE: SETUP AND PROGRAM TAD'S TO OPERATE AS VAV UNITS, SET MINIMUM AIRFLOW EQUAL TO MAXIMUM AIRFLOW.

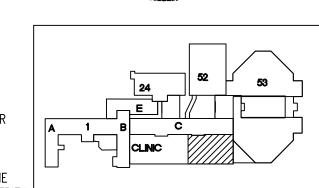


ASBESTOS NOTE:

IF THE EXECUTION OF THIS WORK REQUIRES THE DISTURBING OF ANY SUBSTANCE WHICH APPEARS TO BE ASBESTOS OR WHICH MAY CONTAIN ASBESTOS FIBER, NOTIFY THE OWNER BEFORE CONTINUING WORK AT THE SUSPECT LOCATION. ANY MATERIAL TESTING POSITIVE SHALL BE REMOVED BY THE OWNER BEFORE WORK CONTINUES.

NOTE: EXISTING CONDITIONS SHOWN WERE DERIVED FROM OWNER FURNISHED DRAWINGS AND FIELD OBSERVATIONS. SOME BUILDING FEATURES AND MEP SYSTEMS ARE NOT SHOWN FOR CLARITY. FIELD VERIFY BUILDING CONSTRUCTION. FIELD VERIFY THE LOCATION, SIZE AND QUANTITY OF ALL EQUIPMENT.

NOTE: REFER TO DETAILS AND SCHEMATICS FOR PIPING, VALVES, FITTINGS AND OTHER APPURTENANCES REQUIRED. BUT NOT SHOWN FOR CLARITY.



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AS SHOWN	

REVISIONS: DESCRIPTION:



ENTERING SUPPLY TEMPERATURE

LSA LEAVING SUPPLY TEMPERATURE

Dept. of Veterans Affairs Jack C. Montgomery Medical Center 1011 Honor Height Drive Muskogee, Oklahoma 74401

ESA ENTERING EXHAUST TEMPERATURE

(LSA) LEAVING EXHAUST TEMPERATURE

ENGINEER: RMD CONSULTING, LLC 2815 VALLEY VIEW LANE, STE. 214 DALLAS, TX 75234 P: 972-488-8077 F: 972-488-8174 OK REG. ENGINEERING FIRM: 5183

CONSULTANTS: ARCHITECT: ARCHITECTURAL CONCEPTS, INC. 669 AIRPORT FREEWAY, STE. 300 HURST, TX 76053 P: 817-285-8885 F: 817-285-8021

APPROVED: APPROVED: APPROVED:

APPROVED: APPROVED: Infection Control Nurse APPROVED: APPROVED: Industrial Hygienist APPROVED: President A.F.G.E. 2250

APPROVED: Interior Designer

APPROVED: Medical Center Director	DRAWING TITLE		PROJECT TITLE			
APPROVED: Associate Director	HVAC CONTROLS		REPLACE LABORATORY AIR HANDLING UNITS			
APPROVED: Chief of Staff	PROJECT NO. 623-11-107	CONTRACT NO. VA256-12-C-0295	DESIGNED BY:	DRAWN BY:	CHECKED BY:	
APPROVED: Chief of Engineering Service	BUILDING NO. CLINICAL	AUTOCAD FILE NAME:	Jack C. Montgomery VA Medical Center			
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